REMARKS

In view of the following discussion, the Applicants submit that none of the claims now pending in the application is made obvious under the provisions of 35 U.S.C. §103. Thus, the Applicants believe that all of the presented claims are now in allowable form.

I. ALLOWABLE SUBJECT MATTER

The Applicants thank the Examiner for her comments regarding the allowability of claims 44-50, as well as regarding the allowability of claims 5-8, 10, 11, 20, 21 and 23, if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. The Applicants submit that allowed claims 44-50, previously submitted as new claims, present claims 5-8, 11, 20, 21 and 23 in such a form. However, in light of the arguments presented below, the Applicants respectfully submit that claims 1 and 16, from which claims 5-8, 10, 11, 20, 21 and 23 depend, are patentable over the cited references. Therefore, the Applicants respectfully submit that claims 5-8, 10, 11, 20, 21 and 23 are in allowable form as they stand.

II. REJECTION OF CLAIMS 1-4, 9, 12-19 AND 22 UNDER 35 U.S.C. § 103

The Examiner rejected claims 1-4, 9, 12-19 and 22 under 35 U.S.C. §103(a) as being unpatentable over the Tyan patent (United States Patent No. 6,473,517, issued on October 29, 2002, hereinafter Tyan) in view of the Saund patent (United States Patent No. 5.764,383, issued on June 9, 1998, hereinafter "Saund"). The Applicants respectfully traverse the rejection.

Tyan teaches a method for recognizing a license plate number in an image of a license plate. A captured image of a license plate is preprocessed in at least one of two ways to enhance subsequent character recognition results. A first preprocessing technique compensates for tilt or skew of the license plate along a single axis in the image by adjusting (*e.g.*, rotating) the image in the axis of tilt (*see* Tyan, column 5, lines 40-46: "A license plate ... is tilted by an angle with respect to the horizontal axis ... [T]his angle is then corrected to give an image with a rotation angle of about zero degrees ..."). In a second refinement step, the position of the license plate within the

image may be further refined by cropping regions of the image that are not necessary for recognition of the license plate number (*e.g.*, the plate frame or the body of the vehicle to which the plate is attached; *see*, Tyan, column 5, lines 51-53: "It is necessary to perform a refined localization that leaves out unnecessary regions but retains plate characters."). Once the region of the license plate is localized in this manner, portions of the license plate number may be iteratively segmented into suspected character regions, which are subjected to optical character recognition (OCR) processing in order to identify the license plate number depicted in the captured image.

Saund teaches a method for scanning books using a scanning system that scans pages of an open book in a face-up position. Specifically, Saund teaches two methods for correcting an image. First, Saund teaches correcting for skew (*i.e.*, rotation about an axis perpendicular to the support plane, as depicted by Saund in Figures 5 and 6) in a scanned line of text by additionally scanning a predetermined number of adjacent lines of raw image data (*e.g.*, text). The number of adjacent lines that must be scanned in order to correct for the skew depends on the magnitude of the angle with which the spine of the book is skewed from a reference line (which is parallel to a scan line of the scanning assembly). Second, Saund teaches "de-warping" the scanned line of text to account for distortions caused by the non-planar shape of the bound book's pages (*e.g.*, the bend of the pages from the spine as depicted by Saund in Figure 5), by polling locations in the raw image data ("image space") from the scanned page ("page space").

The Examiner's attention is directed to the fact that both Tyan and Saund fail to disclose or suggest the novel invention of performing an adjustment of a detected text region <u>along three axes</u> to produce a rectified or corrected image, as claimed in Applicants' independent claims 1 and 16. Specifically, Applicants' claims 1 and 16 positively recite:

1. Method for recognizing text in a captured imagery, where said captured imagery is of a three-dimensional scene, said method comprising the steps of:

(a) detecting a text region in the captured imagery;

(b) adjusting <u>along three axes</u> said detected text region to produce a rectified image; and

(c) applying optical character recognition (OCR) processing to said rectified image to recognize the text in the captured imagery. (Emphasis added)

16. Apparatus for recognizing text in a captured imagery, where said captured imagery is of a three-dimensional scene, said apparatus comprising:

means for detecting a text region in the captured imagery;

means for adjusting along three axes said detected text region to produce a rectified image; and

means for applying optical character recognition (OCR) processing to said rectified image to recognize the text in the captured imagery. (Emphasis added)

Applicants' invention is directed to a method and apparatus for recognizing text in an image sequence of scene imagery, *e.g.*, where the text information is incidental to some other subject being recorded and the position or angle of the text information may therefore render the text difficult to recognize using conventional OCR methods. In many circumstances, it is desirable to identify incidental text information captured in an imagery (*e.g.*, a three-dimensional scene of the real world), such as a name on a street sign. Conventional text recognition programs and systems typically operate on the assumption that the text lies in a plane that is orientated roughly perpendicular to the optical axis of the camera (*e.g.*, as in the case of a document placed on a scanner). However, in the case of text that is incidental to a main subject being recorded, such as text on street signs, billboards or name plates, the text often lies in a plane that is angled or otherwise distorted relative to the optical axis of the camera, and the text therefore may not be easily or accurately recognized by conventional OCR methods.

The present invention provides a method and apparatus for recognizing text in a captured imagery in which detected text regions are adjusted along three axes (*e.g.*, horizontal, vertical and torsional/depth) to account for distortion due to non-perpendicular alignment with an optical axis of a camera recording the imagery. The detected text regions may be both rotated and stretched to produce a rectified (*e.g.*, distortion-compensated) image. These rectified images are then subjected to OCR processing in order to recognize the text contained therein. Thus, by adjusting the text regions along three axes, the method can compensate for non-perpendicular text orientation angles, thereby producing a more accurate result.

In contrast, Tyan teaches a method for preprocessing a character region in a captured image of a license plate by adjusting the character region along two axes at

most (*e.g.*, horizontal and vertical), and then cropping extraneous imagery in the captured image. In other words, Tyan only teaches adjusting the text regions in no more than two dimensions followed by a simple cropping operation, which does not amount to an adjustment along three axes as claimed by the Applicants. The Examiner concedes in the Office Action that Tyan does not teach adjusting the text region in "all three dimensions" (*e.g.*, along three axes). The Examiner submits, however, that Saund discloses adjusting a detected text region along three axes. The Applicants respectfully disagree with this conclusion. In particular, Applicants submit that neither of the two methods for correcting an image taught by Saund, applied alone or in combination with the methods of Tyan, teaches an adjustment along three axes of an image, as claimed by the Applicants.

The first method taught by Saund (correcting for skew) teaches, at most, an adjustment along one axis. Saund "... performs electronic perspective correction to account for rotation of the spine of a non-planar bound document relative to a reference line in a support plane ..." (See, Saund, Abstract). This correction is depicted by Saund in Figures 5 and 6, and shows correction of an angle of rotation (θ) relative to a single axis perpendicular to the support plane. Thus, with respect to this first method, Saund does not provide any additional relevant teachings over those of Tyan.

The second method taught by Saund (de-warping an image) does not adjust an image along any axis. As taught by Saund, de-warping corrects an image for distortions caused by the curved displacement of the non-planar book pages relative to the support plane, as illustrated in Saund's Figure 5. This does not teach adjustment along any axis of the image. Adjusting an image along three axes, as claimed by the Applicants, comprises rotating an image around three axes in order to compensate for oblique camera angles. Saund teaches that de-warping to correct displacement is accomplished by polling locations in image space from page space using a page space transform (See, Saund, column 7, line 48 - column 8, line 37). This is necessary, as there is no rotational transformation about any axis or axes that will correct for curved displacement, as the displacement is different at different points of the image.

Only one method taught by Saund (*i.e.*, skew correction) involves adjustment about an axis, and that method only teaches adjustment about one axis at most. Applicants submit therefore that Tyan and Saund, singly or in any permissible combination, do not teach, suggest or make obvious an adjustment about three axes, as positively claimed by the Applicants.

Moreover, there is no suggestion or motivation to combine Tyan and Saund in a manner that would yield the claimed invention. As described above, Tyan teaches a method for adjusting an image of a planar surface (*i.e.*, a license plate) to facilitate character recognition. Saund, by contrast, teaches a method for correcting distortion of an image of a non-planar surface (*e.g.*, a bound book, *See*, Saund, column 10, line 34 – 36: "In summary, the present invention provides a method and apparatus for correcting non-planar documents that are spaced from and skewed relative to a support plane", emphasis added). As discussed above, methods for adjusting images for displacements of planar and curved objects differ, because curved displacement of an image will be different at different points in the image. The Applicants therefore disagree with the Examiner's conclusion that it would have been obvious "to incorporate what was disclosed in Saund's scanner ... into Tyan's vehicle license plate recognition system ..." and respectfully submit that the Examiner is using hindsight to pick and choose elements from the references to support the rejection.

It is impermissible to use the claims as a framework from which to choose among individual references to recreate the claimed invention. *W. L. Gore Associates, Inc. v. Garlock, Inc.*, 220 U.S.P.Q. 303, 312 (1983). Moreover, the mere fact that a prior art structure could be modified to produce the claimed invention would not have made the modification obvious unless the prior art suggested the desirability of the modification. *In re Fritch*, 23 U.S.P.Q. 2d 1780, 1783, Fed. Cir. (1992); *In re Gordon*, 221 U.S.P.Q. 1125, 1127, Fed. Cir. (1984) (emphasis added). The rules applicable for combining references provide that there must be a suggestion from within the references to make the combination. *Uniroyal v. Rudkin-Wiley*, 5 U.S.P.Q. 2d 1434, 1438 (Fed. Cir. 1988); *In re Fine*, 5 U.S.P.Q. 2d at 1599 (emphasis added). Therefore, the teachings of Tyan do not provide any justification for combination with the non-planar document scanning

methodology of Saund. Thus, for at least the foregoing reasons, independent claims 1 and 16 are not made obvious by the teaching of Tyan in view of Saund.

Dependent claims 2-4, 9, 12-15, 17-19 and 22 depend from claims 1 and 16, and recite additional features therefore. As such, and for at least the same reasons set forth above with respect to the rejection of independent claims 1 and 16, the Applicants submit that claims 2-4, 9, 12-15, 17-19 and 22 are not made obvious by the teachings of Tyan in view of Saund. Therefore, the Applicants submit that dependent claims 2-4, 9, 12-15, 17-19 and 22 also fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder. Accordingly, the Applicants respectfully request that the rejection to claims 1-4, 9, 12-19 and 22 under 35 U.S.C. §103 be withdrawn.

III. INFORMATION DISCLOSURE STATEMENT

The Examiner's attention is directed to the fact that Applicants are filing an Information Disclosure Statement along with the present Response to the Final Office Action. The Examiner is respectfully urged to consider the reference cited in the Information Disclosure Statement in connection with any response to the Applicants arguments.

IV. CONCLUSION

Thus, the Applicants submit that all of the presented claims now fully satisfy the requirements of 35 U.S.C. §103. Consequently, the Applicants believe that all of the presented claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the issuance of a final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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